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Transboundary Water Conflicts and Cooperation

Aaron T. Wolf

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Pre-Conference Statement for the Session on:
“Transboundary Water Conflicts and Cooperation”

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“Allocating and Managing Water for a Sustainable Future”

Natural Resources Law Center
University of Colorado School of Law

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Editor’s Note: The following document is a draft and incomplete chapter, prepared by the Session Coordinator in order to help steer and organize the initial thinking of the panelists, and to serve as a reference for conference attendees. Upon completion of the conference, this material will be revised and integrated with material from the panelists and will reflect ideas raised at the conference. Ultimately, it will comprise a chapter in a book based on the conference. Given that this is a working document, the author should not be directly quoted, and the draft nature of the document should be noted in any use of, and references to, this work.

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Introduction

Transboundary water disputes occur whenever demand for water is shared by any sets of interests, be they political, economic, environmental, or legal. Conflicts over shared water resources occur at multiple scales, from sets of individual irrigators, to urban versus rural uses, to nations that straddle international waterways. Transboundary waters share certain characteristics that make their management especially complicated, most notable of which is that these basins require a more-complete appreciation of the political, cultural, and social aspects of water, and that the tendency is for regional politics to regularly exacerbate the already difficult task of understanding and managing complex natural systems.

At the international level, security studies are only recently recognizing the mutual destabilizing forces of poverty and stability. The process of poverty alleviation is often hampered in regions where human security is at risk. As a consequence, much of the thinking about the concept of “environmental security” has moved beyond a presumed causal relationship between environmental stress and violent conflict to a broader notion of “human security” – a more inclusive concept focusing on the intricate sets of relationships between environment and society.

Within this framework, water resources – including scarcity, distribution, and quality – have been named as the factor most likely to lead to intense political pressures, while threatening the processes of sustainable development and environmental protection. Water ignores political boundaries, evades institutional classification, and eludes legal generalizations. Worldwide, water demands are increasing, groundwater levels are dropping, water bodies are increasingly contaminated, and delivery and treatment infrastructure is aging.

From the Klamath to the Jordan, transboundary water issues are a priority at state, national, and international levels. Although wars over water have not occurred, there is ample evidence showing that the lack of clean freshwater has been linked to poverty and has led to intense political instability, and that acute violence has occasionally been the result. While these disputes also occur at the sub-national level, the human security issue is more subtle and more pervasive. As water quality degrades – or quantity diminishes – over time, the effect on the stability of a region can be unsettling, nowhere more so than in basins which cross political boundaries.

There are 261 watersheds which cross the political boundaries of two or more countries. These international basins cover 45.3% of the land surface of the earth, affect about 40% of the world’s population, and account for approximately 60% of global river flow (Wolf et. al 1999). [See Figure 1: International Rivers.] Disparities between riparian nations – whether in economic development, infrastructural capacity, or political orientation – add further complications to water resources development, institutions, and management. As a consequence, development, treaties, and institutions are regularly

seen as, at best, inefficient; often ineffective; and, occasionally, as a new source of tensions themselves. Despite the tensions inherent in the international setting, riparians have shown tremendous creativity in approaching regional development, often through preventive diplomacy, and the creation of “baskets of benefits” which allow for positive-sum, integrative allocations of joint gains. Some of these approaches may be “scalable,” and relevant to the problems of the US West.

Transboundary Waters of the West

International Waters

There are two sets of international rivers in western North America – those shared between the US and Canada, primarily the Columbia, and those shared between the US and Mexico, especially the Colorado and the Rio Grande/Rio Bravo. Each is administered through different institutional structures – the International Joint Commission in the case of US-Canada, and the International Boundary and Waters Commission for US-Mexico – and thus are described and assessed separately.

US-Canada Waters. Canada and the United States share one of the longest boundaries in the world, at approximately 4,000 miles. Industrial development in both countries, which in the humid eastern border region relied on water resources primarily for waste disposal, had led to decreasing water quality along their shared border to the point where, by the early years of the twentieth century, it was in the interest of both countries to seriously address the matter. Prior to 1905, only *ad hoc* commissions had been established to deal with issues relating to shared water resources as they arose. Both countries considered it within their interests to establish a more-permanent body for the joint management of their shared water resources.

As Canada and the United States entered into negotiations to establish a permanent body, the tone was informed by the concerns of each nation. For the United States, the overriding issue was sovereignty. While it was interested in the practical necessity of an agreement to manage transboundary waters, it did not want to relinquish political independence in the process. This concern was expressed by United States position that absolute territorial sovereignty be retained by each nation for the waters within its territory -- tributaries should not be included in the Commission's authority. The new body might retain some of the *ad hoc* nature of prior bodies, so as not to acquire undue authority. Canada was interested in establishing an egalitarian relation with the United States. It was hampered not only because of the relative size and level of development of the two states at the time, but also because Canadian foreign policy was still the purview of the United Kingdom -- negotiations had to be carried out between Ottawa, Washington, and London. Canada wanted a comprehensive agreement, which

would include tributaries, and a Commission with greater authority than the bodies of the past.

The "Treaty Relating to Boundary Waters between the United States and Canada," signed between the United Kingdom and the United States in 1909, reflects the interests of each negotiating body. The Treaty establishes the International Joint Commission with six commissioners, three appointed by the governments of each State. Canada accepted US sovereignty concerns to some extent -- tributary waters are excluded. The United States in turn accepted the arbitration function of the Commission and allowed it greater authority than it would have liked. The Treaty calls for open and free navigation along boundary waters, allowing Canadian transportation also on Lake Michigan, the only one of the Great Lakes not defined as boundary water. Although it allows each State unilateral control over all of the waters within its territory, the Treaty does provide for redress by anyone affected downstream. Furthermore, the Commission has "quasi-judicial" authority: any project which would affect the "natural" flow of boundary waters has to be approved by both governments. Although the Commission has the mandate to arbitrate agreements, it has never been called to do so. The Commission also has investigative authority -- it may have development projects submitted for approval, or be asked to investigate an issue by one or another of the governments. Commissioners act independently, not as representatives of their respective governments.

In 1944, the US and Canada both asked the IJC to study the feasibility of cooperative development in the Columbia Basin, a process which lasted 20 years, until the signing of the of the Columbia River Treaty and Protocol in 1964. The focus of the treaty is a series of dams subsequently built for hydropower generation and flood control along the main stem and tributaries. The length of the negotiations reflect disagreements both within nations -- notably in the US between upstream states of Idaho and Montana, where the most inundation would have occurred, and downstream Washington and Oregon where the bulk of the benefits would be realized -- as well as between the US and Canada. A budding environmental movement, concerned with loss of salmon runs, winter elk habitat, and the inundation of national parks, also played a role. Many of these concerns remain today (Muckleston, in Nakayama et. al).

According to Muckleston (in Nakayama et. al), the Treaty stipulates: 1) the equal sharing of downstream benefits from hydropower and flood control in the US that result from upstream storage in Canada; 2) the three storage sites in Canada, including the total volume for Treaty implementation (15.5 MAF); 3) an option for the US to build the Libby storage project; 4) the method, amount, and timing of US payments to Canada; 5) the permissibility to transfer water from the Kootenay to the Columbia, including the timing and the maximum volumes to be transferred; 6) the option to transfer water out of the Columbia Drainage Basin; 7) the sequence of steps to be taken for conflict resolution if difficulties arise during Treaty operations, and 8) the creation of new and/or designation of existing institutions to supervise and operate the Treaty.

The US Entity is composed of the Bonneville Power Administration (BPA) and the North Pacific Division, Corps of Engineers (COE), while the Canadian Entity is the British Columbia Hydro and Power Authority (BCH). The Entities work through committees equally represented by members from each Entity. The Operating Committee is instrumental in the planning and execution of treaty reservoir operations covered under the Treaty.

While the treaty has been effective in managing water and power according to the priorities set during initial negotiations, many concerns of the day, as well as a host of new issues brought on by changing needs, growing populations, and increasing environmental awareness, remain.

US-Mexico Waters¹. The border region between the United States and Mexico has fostered its share of surface-water conflict, from the Colorado to the Rio Grande/Rio Bravo. It has also been a model for peaceful conflict resolution, notably the work of the International Boundary and Water Commission (IBWC), the supra-legal body established to manage shared water resources as a consequence of the 1944 US-Mexico Water Treaty.

The International Boundary and Water Commission has its roots in the 1848 Treaty of Guadalupe Hidalgo which established a temporary joint boundary commission to mark and map the new boundary between the two countries. An 1889 convention established the International Boundary Commission, charging it with resolving "...differences or questions that may arise on that portion of the frontier between the United States of America and the United States of Mexico where the Rio Grande and the Colorado Rivers form the boundary line..." The Commission's status was permanently extended in 1900.

The 1944 Treaty between the United States and Mexico, "Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande," firmly established the international character of waters on the border between the United States and Mexico. It specified in considerable detail the amount of water allocable to each country from the boundary rivers and their tributaries, with detailed delivery schedules and procedures for water accounting. Additionally, the treaty established the framework for construction of international storage reservoirs, diversion dams, and flood control works. This treaty also clearly established the role of the International Boundary and Water Commission, United States and Mexico, (IBWC) as the international organization that the two countries would rely on in addressing these transboundary water issues.

¹ This section draws from Nakayama et al., (forthcoming).

The IBWC consists of a Mexican Section, headquartered in Cindad Juarez, Chihuahua and a United States Section, headquartered just across the Rio Grande in El Paso, Texas - the midpoint along the international border. Each section is headed by an engineer commissioner appointed by the president of his country and operates under the guidance of each country's respective foreign affairs department.

The first water distribution treaty between the two countries, the Convention of March 1, 1906, established an agreed-upon amount of Rio Grande water allotted to Mexico at Ciudad Juarez, Chihuahua. This international agreement determined the national ownership of waters for the upper 145 kilometers of the Rio Grande's international segment. Decades later, in 1944, the national ownership for the remaining 1874 kilometers of the Rio Grande downstream to the Gulf of Mexico was established along with the authority to jointly construct impoundment and other engineering works for each country to make the greatest beneficial use of its apportioned waters.

The treaty provisions related to the Colorado River and the practical effects of their implementation remain an ongoing source of discussion between the two countries. Over the past half century, various differences have arisen which required substantial attention from the IBWC in order to reach a satisfactory conclusion. The Treaty provides a special annual allotment to Mexico and obligates the United States to provide that water under annual schedules provided by Mexico. There are provisions for times of excess flows and for times of shortages. In addition the treaty provides for works for the control of flood waters and for diversion works by Mexico.

During the 1950's, the United States regularly made surplus declarations. However, as river conditions changed in the 1960s, the United States determined that no surplus existed. Mexico, having become accustomed to the surplus deliveries, expressed an interest in continuing to receive the larger deliveries. Mexico was also accustomed to receiving water with salinity adequate for their irrigation uses. The lower flows matter was complicated with the introduction from an irrigation district in Arizona of pumped saline drainage, which nearly tripled the salinity in waters delivered to Mexico. The salinity problem was dealt with through five-year arrangements of the IBWC supported by expertise from United States and Mexican federal agencies. The problem arose again in 1972, leading to special Presidential task force, the efforts of which resulted in a new IBWC agreement in 1973 for a solution of the salinity problem.

In the 1980s, questions arose over surplus waters and their impacts in Mexico, a matter that was dealt with through a new technical information exchange program of the IBWC. Similarly, questions arose in the 1990s over silt deposition and flood water conveyance and salinity peaks in the waters delivered to Mexico. The IBWC turned its information exchange program into proactive international task forces to deal with the salinity problem, the immediate silt problem, and the longer term conveyance questions. More recently, the IBWC has extended their information development task forces to a fourth group dealing with the Colorado River Delta.

Another more recent complication are the difficulties encountered in managing shared surface-water, which can pale in comparison to trying to allocate groundwater resources. Each aquifer system is generally so poorly understood that years of study may be necessary before one even knows what the bargaining parameters are. Mumme (1988) has identified 23 sites in contention in six different hydrogeologic regions along the 3,300 kilometers of shared boundary. While the 1944 Treaty mentions the importance of resolving the allocations of groundwater between the two states, it does not do so. In fact, shared surface-water resources were the focus of the IBWC until the early 1960's, when a US irrigation district began draining saline groundwater into the Colorado River and deducting the quantity of saline water from Mexico's share of freshwater. In response, Mexico began a "crash program" of groundwater development in the border region, to make up the losses. These tensions have resulted in renewed interest in resolving these topics.

An interesting aspect of the various IBWC agreements is the way in which binational projects are funded. In the case of the system to deliver Colorado River water to Mexico, the treaty required Mexico to pay for some works *in the United States* to protect U.S. interests from flooding. In addressing salinity issues, the United States agreed to pay for works *in Mexico*. Flexibility in allocating costs based on the benefits accrued to each country and the cost each country would incur if a project were domestic rather than binational are among the factors considered by the IBWC in determining a fair and equitable cost distribution that may or may not result in a 50-50 cost share. This has allowed the IBWC to deal with significant questions *in a cooperative manner*.

One unfortunate byproduct of early negotiations between the US and Mexico was the addition to the international waters lexicon of the "Harmon Doctrine." This doctrine, named for the US attorney-general who suggested this stance in 1895 regarding a dispute with Mexico over the Rio Grande, argues that a nation has absolute rights to water flowing through its territory (LeMarquand 1993; McCaffrey 1996).ⁱ Considering this doctrine was immediately rejected by Harmon's successor and later officially repudiated by the US (McCaffrey 1996), was never implemented in any water treaty (with the rare exception of some internal tributaries of international waters), was not invoked as a source for judgment in any international water legal ruling, and was explicitly rejected by the international tribunal over the Lac Lanoux case in 1957, the Harmon Doctrine is wildly over-emphasized as a principle of international law.ⁱⁱ Nevertheless, upstream nations, states, territories, and even individual landowners to this day regularly call on some variation of the Harmon Doctrine in the opening stages of negotiations.

Interstate Rivers

In addition to the rivers extending into Canada and Mexico, the United States is also home to many interstate rivers and, thus, interstate conflicts. In the American West,

questions of allocation typically dominate interstate water disputes. The Constitution provides two strategies for resolving these conflicts (Getches, 1990).ⁱⁱⁱ First, as the holder of “original jurisdiction” in disputes among states, the U.S. Supreme Court is empowered to resolve interstate complaints. Traditionally, this has been done using the highly flexible doctrine of “equitable apportionment” in which issues of equity and need are used to craft allocations that can be later revisited by the Court should conditions change. The initial use of equitable apportionment was on the Arkansas River between Colorado and Kansas in 1907, although the most celebrated case in 1931 concerned the Delaware River (*Kansas v. Colorado*, 206 U.S. 46 (1907); *New Jersey v. New York*, 283 U.S. 336 (1931)).

The second and much more common approach for resolving interstate conflicts in the West has been the use of interstate compacts (McCormick, 1994). Compacts are legally binding agreements between states, as authorized by the compact clause of the Constitution. States generally prefer compacts over equitable apportionment proceedings since they can retain control over the dispute resolution process, the terms of the ultimate agreement, and the implementation arrangements. Compacts also allow allocations to occur long before needs materialize, which can greatly aid long-term planning and management programs. For these and other reasons, even the courts typically encourage compacts over judicial proceedings (e.g., see *Colorado v. Kansas*, 320 U.S. 383, at 392 (1943)).

Interstate compacts can be found throughout western river basins and the plains to the east receiving Rocky Mountain snowmelt. Examples include the Arkansas (CO-KS, 1949; KS-OK, 1965; and AR-OK, 1970), Bear (ID-UT-WY, 1955), Belle Fourche (WY-SD, 1943), Big Blue (NE-KS, 1971), Canadian (NM-TX-OK, 1950), Colorado (WY-CO-UT-NM-NV-AZ-CA, 1922), Costilla Creek (CO-NM, 1944), Klamath (OR-CA, 1956), La Plata (CO-NM, 1922), Pecos (NM-TX, 1949), Red (TX-OK-AR-LA, 1978), Republican (CO-NE-KS, 1943), Rio Grande (CO-NM-TX, 1938), Sabine (TX-LA, 1953), Snake (WY-ID, 1949), South Platte (CO-NE, 1923), Upper Colorado (WY-CO-UT-NM, 1948), Upper Niobrara (WY-NE, 1962), and Yellowstone Rivers (WY-MT-ND, 1950). Colorado is a party to nine interstate compacts!^{iv}

Typically, the negotiation and approval of interstate compacts has followed a 5-step process: (1) Congress authorizes the states to negotiate a compact, (2) state legislatures appoint commissioners, (3) the commissioners meet, usually aided by a federal chairman, to negotiate and sign the agreement, (4) the state legislatures ratify the compact, and (5) Congress ratifies the compact. Omitted from this description is the role of the federal water development in stimulating agreements, as the Department of the Interior typically required states to resolve interstate water allocation disputes prior to commencing federally funded river basin developments. The best example of this phenomenon occurred in the Upper Colorado River Basin, where a Bureau of Reclamation study identifying 134 potential projects prompted the basin states within four months to begin compact negotiations (Terrell, 1965).

The key element in water allocation compacts is the mathematical formula used to apportion flows. Four different allocation strategies are typically seen: (1) systems based on maintaining minimum flow levels at state lines (or other useful gaging stations), (2) approaches based on reservoir storage, (3) formulas allocating fixed or percentage-based rights to consumption or diversion, and (4) a requirement—seen only in the Colorado River basin—for upstream states to deliver downstream a minimum *volume* (rather than a constant *flow* rate) over a lengthy time period. Several formulas have been problematic, largely due to incorrect assumptions about precipitation and runoff levels, and due to the growth of water demands in some areas beyond compact apportionments (Kenney, 1996).

Administering compact allocations and resolving conflicts are duties frequently delegated to compact commissions formed by the interstate agreements. Most compacts feature a compact commission, often with a federal (usually non-voting) member. In many cases, however, disputes escalate to the judiciary. Among the most problematic compacts have been those for the La Plata, Pecos, Canadian, Arkansas, Rio Grande, and Colorado Rivers.

Water allocation compacts often provide an element of certainty, stability, and civility in interstate water issues. Ironically, this certainty can be somewhat counterproductive, in that it can eliminate the need and opportunity for continued interaction among the basin states. With the very limited exception of periodic meetings of compact commissioners, so-called “successful” compacts generally do not require interstate coordination or ongoing cooperation, and provide little reason for one state to be concerned with the water needs of the other. Unlike an equitable apportionment, compacts cannot be modified unilaterally except, perhaps, by congressional action—and no congress has demonstrated an interest in testing that power.

Compacts also do not effectively reconcile hydrologic and political regions. While the signatories to a compact may collectively encompass the entire drainage basin of a particular river, the boundaries of those states do not follow the actual contours of the river basin. Consequently, within states, issues arise about whether to use compact apportionments within the basin itself, or in areas outside the basin. Many of the largest users of the Colorado River, for example, lie outside the topographic bounds of the river basin, but are within the states recognized in the compacts. Similarly, most compacts fail to recognize water rights associated with tribal lands and other federally reserved lands within the signatory states.

Also of concern in most compacts is the limited attention given to competing water uses and sectors, and in the case of environmental protection, competing water values. With few exceptions, these issues are dealt with in the context of state water law, often with the use of markets.^v One of the few exceptions is the Northwest Planning Power Council, which is charged with balancing hydropower generation and salmonid management in the U.S. section of the Columbia River system.^{vi} This sort of multi-faceted mandate is rarely seen in western compacts and compact commissions; however,

nationally, interstate arrangements addressing pollution control, flood control and planning, and project development are relatively common (Muys, 1971).

Local Water Issues

Multi-scalar studies are on the cutting edge of research in water resources management. Much literature on transboundary waters treats political entities as homogeneous monoliths – “Canada feels...” or “The US wants...” Analysts are only recently highlighting the pitfalls of this approach, often by showing how different subsets of actors relate very different “meanings” to water (see, for example, Blatter and Ingram eds. 2001). Rather than being simply another environmental input, water is regularly treated as a security issue, a gift of nature, or a focal point for local society. Disputes, therefore, need to be understood as more than “simply” over a quantity of a resources, but also over conflicting attitudes, meanings, and contexts. In the US West, local water issues revolve around core values which often date back generations. Irrigators, Native Americans, and environmentalists, for example, can see water as tied to their very ways of life, and increasingly threatened by newer uses for cities and hydropower.

This shift means that water management must be understood in terms of the specific, local context. History matters, as do power flows – the “meaning” of water to its users is as critical to understanding disputes, and sometimes more so, than its quantity, quality, and timing. For this new world, new tools for analysis are being added to the traditional arsenal, including network analysis, discourse analysis, and historical and ethnographic analysis, each of which can be bolstered and made more robust through the judicious application of appropriate information technologies.

One highlight of these new approaches is that the results of conflict analysis are very different depending on the scale being investigated. To clearly understand the dynamics of water management and conflict potential, then, thorough assessments would investigate dynamics at multi-scales simultaneously. María Rosa García-Acevedo (2001), for example, puts nominally a “US-Mexico” dispute over the Colorado into its specific historic context, and tracks water’s changing meanings to the local populations involved, primarily indigenous groups and US and Mexican farm communities, throughout the 20th century. The local setting strongly influences international dynamics and vice versa.

What one notices in the global record of water negotiations is that many of those surveyed begin where many Western US issues are now, i.e. with parties basing their initial positions in terms of rights -- the sense that a riparian is entitled to a certain allocation based on hydrography or chronology of use. Irrigators in the Klamath basin, for example, invoke rights under the Reclamation Act while environmentalists refer to the Endangered Species Act. Up-stream riparians often invoke some variation of the Harmon Doctrine, claiming that water rights originate where the water falls. Down-

stream riparians often claim absolute river integrity, claiming rights to an undisturbed system or, if on an exotic stream, historic rights based on their history of use.

The Columbia Basin offers another case in point. Water resources issues in the Columbia River basin transitioned from intranational to international in 1944 as Canadian and US planners recognized that cooperative development might well be superior to individual actions, and both countries requested the International Joint Commission (IJC) to study the feasibility of cooperative development in the Columbia Basin. By 1964, the Columbia River Treaty and Protocol were ratified by the governments of Canada and the USA. The treaty is one of the most sophisticated in the world, particularly because it circumvents the zero-sum approach to allocating fixed quantities of water by instead allocating to each country an equal share of benefits derived from the shared basin. Hydropower production, flood control, and other benefits are quantified and shared annually, and there is little dispute across international boundaries.

Yet at the sub-national level, and in response to the weaknesses of top-down legislation over locally generated issues such as non-point source pollution, management authority is slowly being diffused to local watershed councils. The effectiveness of these councils is directly linked to the availability of information. Access to data and effective decision-making tools have been regularly named as critical to building institutional capacity at this local level, but sophisticated water models are generally neither user-friendly nor inclusive of the types of non-physical data so critical to effective management.

Editor's Note: Based on the conference dialogue, additional information will be added to this chapter, likely in the following categories:

- o Multiscalar Studies and Institutional Capacity
- o International Waters: Conflict and Cooperation
- o Institutional Lessons from Around the World
- o Lessons for the Western U.S.

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Endnotes

ⁱ "The fundamental principle of international law is the absolute sovereignty of every nation, as against all others, within its own Territory" (cited in LeMarquand 1993, 63). Harmon was making the hydrologically preposterous argument that upstream water diversions within the territorial US would not legally affect downstream navigation on international stretches of the Rio Grande since the diversions were to be carried out by individuals, not States (McCaffrey 1997).

ⁱⁱ As far back as 1911, the Institut de Droit International had asserted that the dependence of riparian states on each other precludes the idea of absolute autonomy over shared waters (Laylin and Bianchi 1959, 46).

ⁱⁱⁱ Arguably, a third strategy also exists: congressional apportionment. This approach is not included here because it has only been observed in one, highly unusual situation, and is generally not expected to emerge again as a means for interstate apportionment. The case in question involved allocation of the Lower Colorado River among Arizona, California, and Nevada, something that Congress effectively did (according to a later court decision) in the Boulder Canyon Project Act of 1928 (Getches, 1990).

^{iv} Interstate water allocation compacts are becoming fashionable in the East, as found in the Delaware, Susquehanna, Apalachicola-Chattahoochee-Flint (ACF), and Alabama-Coosa-Tallapoosa (ACT) River Basins. The Delaware and Susquehanna compacts are unique in that they involve the federal government as a signatory and partner (so-called federal-interstate compacts) (GAO, 1981). The agreements in the ACT/ACF basins are unique in that they do not include allocation formulas, but rather establish commissions empowered to later devise allocation compacts.

^v Interstate water markets have not materialized, and may not be legally viable under many compacts.

^{vi} The Northwest Power Planning Council is, admittedly, an odd arrangement led by appointees from the four basin states, formed by a combination of interstate compact and federal legislation, and charged primarily with regulating federal activities—New Federalism in the extreme (Volkman and Lee, 1988).